Canadian Coalition on Wastewater-Related COVID-19 Research

Principles for guiding a valid proof-of-concept pilot study network for wastewater-based viral epidemiology to inform public health decision-making

Wastewater monitoring for SARS-CoV-2 offers considerable potential to provide valuable evidence to inform public health decision makers before they can acquire similar insights by mass clinical sampling of symptomatic individuals in the community. Planning and delivering a wastewater monitoring program requires a sensible, cautious approach, particularly to understand detection limits and significant changes in virus titer (concentration signal). To ensure maximum value in pursuing this approach, we must "under-promise and over-deliver" so this approach can be ultimately justified as worthwhile. The challenge is to identify a meaningful virus signal in community or institutional wastewater against the inevitable background interferences.

1. Clearly define pilot monitoring program objectives

Among the many possibilities for useful evidence (i.e., for guiding public health decision-making) derived from the monitoring of community or institutional wastewater for SARS-CoV-2, is the promising possibility of identifying significant trends in the occurrence of SARS-CoV-2 signal within the receiving sewer system (sewershed).

2. Achieve rapid validation and adoption of a consistent Canadian sampling protocol

Being able to deliver on the program objectives outlined in principle #1 will require the rapid development of a wastewater sampling protocol to maximize an accurate, sensitive and reproducible estimation of the evolution of the SARS-CoV-2 viral titer in the sewage system being monitored. The protocol should ensure generalizability (principle #4) and facilitate maximum collaboration with wastewater utilities (principle #6).

3. Confirm validity of wastewater analyses for SARS-CoV-2

Being able to deliver on the program objectives outlined in principle #1 will require demonstrating that the wastewater sampling analytical protocol also provides an accurate and reproducible representation of the evolution of the SARS-CoV-2 viral titer or temporal trend of viral titer in the sewage system being monitored. Achieving this requires determining all substantial adverse effects, such as from sample processing and storage and the inhibition of analytical methods caused by wastewater sample matrices.

4. Ensure potential for generalizability by fully understanding what samples represent

For the program objectives to be realized, it must be possible to generalize the results obtained and identify trends to accurately and reproducibly represent the system being sampled. Careful consideration must be given to the location of the sample, as well as the implications of the sampling methodology, for the sample results to accurately represent what is being sought.

5. Maximize value of results through strategic pilot project design

The value of information that can be generated from monitoring SARS-CoV-2 in community or institutional wastewater will be best demonstrated by the selection of pilot program locations that are conceptually able to demonstrate meaningful differences that are useful for informing public health decision-making.

6. Maximize potential for productive collaboration with wastewater utilities

The full potential for wastewater monitoring to serve public health decision-making will be best realized if those who are conducting monitoring programs understand the needs, constraints and concerns of cooperating wastewater utilities.

7. Maximize collaboration, cooperation and knowledge exchange

Because of the global impact of the COVID-19 pandemic, an unprecedented international scientific effort has been launched to apply research to address the public health challenges created by the pandemic. Maximum utility of research in this area for informing public health decision-making will be best achieved by maximizing learning from what others are doing in Canada and globally.

8. Consider ultimate use and ethics of data use in public health decision-making

The ultimate objective of informing public health decision-making demands that decision makers are actively engaged in study planning and implementation. Full consideration must be given from the outset to how the wastewater monitoring data is likely to be disseminated and used. This will inevitably invoke ethical considerations in data collection, availability and use. Ethical concerns will likely become greater when the number of contributing individuals in a community or institution is smaller.

For more information on the Canadian Coalition on Wastewater-Related COVID-19 Research, visit covid-19-wastewater-coalition.